

II. CLAIMS

1 – 45. (Cancelled)

46. (Previously Presented) A method of operating an apparatus for suppressing noise in a signal accompanied by noise, the method comprising:

- determining, in the apparatus, a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated periodogram of the accompanying noise;
- determining, in the apparatus, a second term representing a summation of an estimated periodogram of the signal plus an estimated power spectral density of the accompanying noise; and
- generating, in the apparatus, a noise reducing filter operative on the basis of a ratio of the first term to the second term.

47. (Previously Presented) The method according to claim 46, further comprising determining the first term as a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated periodogram of the accompanying noise divided by the noise power spectral density.

48. (Previously Presented) The method according to claim 46, further comprising choosing the predetermined fraction of the estimated periodogram of the accompanying noise included in the first term, so as to include a desired amount of noise in a resulting noise suppressed signal.

49. (Previously Presented) The method according to claim 48, further comprising choosing the predetermined fraction of the estimated periodogram of the accompanying noise included in the first term to provide an acceptable level of context information in a resulting noise suppressed signal.

50. (Previously Presented) The method according to claim 46, further comprising choosing the predetermined fraction of the estimated periodogram of the

accompanying noise included in the first term to be below a mask limit of the signal, so that the noise not audible to a listener.

51. (Previously Presented) A method of operating an apparatus for suppressing noise in a signal accompanied by noise, the method comprising:

- determining, in the apparatus, a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated power spectral density of the accompanying noise;
- determining, in the apparatus, a second term representing a summation of an estimated periodogram of the signal plus the estimated power spectral density of the accompanying noise; and
- generating, in the apparatus, a noise reducing filter operative on the basis of a ratio of the first term to the second term.

52. (Previously Presented) The method according to claim 51, further comprising determining the first term as a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated power spectral density of the accompanying noise divided by the noise power spectral density.

53. (Previously Presented) The method according to claim 51, further comprising choosing the predetermined fraction of the estimated power spectral density of the accompanying noise included in the first term, so as to include a desired amount of noise in a resulting noise suppressed signal.

54. (Previously Presented) The method according to claim 53, further comprising choosing the predetermined fraction of the estimated power spectral density of the accompanying noise included in the first term to provide an acceptable level of context information in a resulting noise suppressed signal.

55. (Previously Presented) The method according to claim 51, further comprising choosing the predetermined fraction of the estimated power spectral density of the accompanying noise included in the first term to be below a mask limit of the signal, so that the noise is not audible to a listener.

56. (Previously Presented) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus configured to:

- determine a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated periodogram of the accompanying noise;
- determine a second term representing a summation of an estimated periodogram of the signal plus an estimated power spectral density of the accompanying noise; and
- generate a noise reducing filter operative on the basis of a ratio of the first term to the second term.

57. (Previously Presented) The apparatus of claim 56, wherein the apparatus is further configured to determine the first term as a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated periodogram of the accompanying noise divided by the noise power spectral density.

58. (Previously Presented) The apparatus according to claim 56, wherein the apparatus is further configured to choose the predetermined fraction of the estimated periodogram of the accompanying noise included in the first term, so as to include a desired amount of noise in a resulting noise suppressed signal.

59. (Previously Presented) The apparatus according to claim 58, wherein the apparatus is further configured to choose the predetermined fraction of the estimated periodogram of the accompanying noise included in the first term to provide an acceptable level of context information in a resulting noise suppressed signal.

60. (Previously Presented) The apparatus according to claim 56, wherein the apparatus is further configured to choose the predetermined fraction of the estimated periodogram of the accompanying noise included in the first term so that it is below a mask limit of the signal so that the noise is not audible to a listener.

61. (Previously Presented) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus configured to:

- determine a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated power spectral density of the accompanying noise;
- determine a second term representing a summation of an estimated periodogram of the signal plus the estimated power spectral density of the accompanying noise; and
- generate a noise reducing filter operative on the basis of a ratio of the first term to the second term.

62. (Previously Presented) The apparatus according to claim 61, wherein the apparatus is further configured to determine the first term as a summation of an estimated periodogram of the desired signal and a predetermined fraction of an estimated power spectral density of the accompanying noise divided by the noise power spectral density.

63. (Previously Presented) The apparatus according to claim 61, wherein the apparatus is further configured to choose the predetermined fraction of an estimated power spectral density of the accompanying noise included in the first term, so as to include a desired amount of noise in a resulting noise suppressed signal.

64. (Previously Presented) The apparatus according to claim 63, wherein the apparatus is further configured to choose the predetermined fraction of the estimated power spectral density of the accompanying noise included in the first term to provide an acceptable level of context information in a resulting noise suppressed signal.

65. (Previously Presented) The apparatus according to claim 61, wherein the apparatus is further configured to choose the predetermined fraction of an estimated power spectral density of the accompanying noise included in the first term is to be below a mask limit of the signal, so that the noise is not audible to a listener.

66. (Previously Presented) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus comprising:

- a noise estimator configured to determine a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated periodogram of the accompanying noise;
- a noise estimator configured to determine a second term representing a summation of an estimated periodogram of the signal plus an estimated power spectral density of the accompanying noise; and
- a noise reducing filter generator configured to generate a noise reducing filter operative on the basis of a ratio of the first term to the second term.

67. (Previously Presented) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus comprising:

- means for determining a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated periodogram of the accompanying noise;
- means for determining a second term representing a summation of an estimated periodogram of the signal plus an estimated power spectral density of the accompanying noise; and
- means for generating a noise reducing filter operative on the basis of a ratio of the first term to the second term.

68. (Previously Presented) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus comprising:

- a noise estimator configured to determine a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated power spectral density of the accompanying noise;
- a noise estimator configured to determine a second term representing a summation of an estimated periodogram of the signal plus the estimated power spectral density of the accompanying noise; and
- a noise reducing filter generator configured to generate a noise reducing filter operative on the basis of a ratio of the first term to the second term.

69. (Previously Presented) An apparatus for suppressing noise in a signal accompanied by noise, the apparatus comprising:

- means for determining a first term representing a summation of an estimated periodogram of the signal and a predetermined fraction of an estimated power spectral density of the accompanying noise;
- means for determining a second term representing a summation of an estimated periodogram of the signal plus the estimated power spectral density of the accompanying noise; and
- means for generating a noise reducing filter operative on the basis of a ratio of the first term to the second term.

70. (Previously Presented) A method of operating an apparatus for suppressing noise in a signal containing noise to provide a noise suppressed signal, the method comprising:

- making, in the apparatus, an estimate of the noise and an estimate of speech together with some but not all of the noise;
- using the estimates in the apparatus to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise,

wherein a first estimation of the gain coefficient is made adaptively in the apparatus and the first estimation is used to produce a noise estimation which is then used in the apparatus to produce a second estimation of the gain coefficient, wherein no use is made of voice activity detection to detect non-speech periods.

71. (Previously Presented) The method according to claim 70, in which the level of the noise included in the estimate of the speech together with some noise is variable so as to include a desired amount of noise in the noise suppressed signal.

72. (Previously Presented) The method according to claim 71, in which the level of the noise provides an acceptable level of context information.

73. (Previously Presented) The method according to claim 70, in which the level of the noise is below a mask limit of the speech and so is not audible to a listener.

74. (Previously Presented) The method according to claim 70, in which the level of noise approaches the mask limit of the speech and so some noise context information is left in the signal.

75. (Previously Presented) The method according to claim 70, in which the estimated noise is power spectral density.

76. (Previously Presented) The method according to claim 70, in which the first estimation is used to update the estimated noise.

77. (Previously Presented) A noise suppressor for suppressing noise in a signal containing noise to provide a noise suppressed signal, the noise suppressor being configured to:

- make an estimate of noise and an estimate of speech together with some but not all of the noise;
- use the estimates to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise,

wherein the apparatus is configured to make a first estimation of the gain coefficient adaptively and to use the first estimation produce a noise estimation which is then used to produce a second estimation of the gain coefficient, wherein no use is made of a voice activity detector to detect non-speech periods.

78. (Previously Presented) The noise suppressor according to claim 77, in which the level of the noise included in the estimate of the speech together with some noise is variable so as to include a desired amount of noise in the noise suppressed signal.

79. (Previously Presented) The noise suppressor according to claim 78, in which the level of the noise provides an acceptable level of context information.

80. (Previously Presented) The noise suppressor according to claim 77, in which the level of the noise is below a mask limit of the speech and so is not audible to a listener.

81. (Previously Presented) The noise suppressor according to claim 77, in which the level of noise approaches the mask limit of the speech and so some noise context information is left in the signal.

82. (Previously Presented) The noise suppressor according to claim 77, in which the estimated noise is power spectral density.

83. (Previously Presented) The noise suppressor according to claim 77, in which the first estimation is used to update the estimated noise.

84. (Previously Presented) A communications terminal comprising a noise suppressor, the noise suppressor being configured to:

- make an estimate of noise and an estimate of speech together with some but not all of the noise;
- use the estimates to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise,

wherein the apparatus is configured to make a first estimation of the gain coefficient adaptively and to use the first estimation produce a noise estimation which is then used to produce a second estimation of the gain coefficient, wherein no use is made of a voice activity detector to detect non-speech periods.

85. (Previously Presented) A communications network comprising a noise suppressor, the noise suppressor being configured to:

- make an estimate of noise and an estimate of speech together with some but not all of the noise;
- use the estimates to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise,

wherein the apparatus is configured to make a first estimation of the gain coefficient adaptively and to use the first estimation produce a noise estimation which is then used to produce a second estimation of the gain coefficient, wherein no use is made of a voice activity detector to detect non-speech periods.

86. (Previously Presented) A noise suppressor for suppressing noise in a signal containing noise to provide a noise suppressed signal, the noise suppressor comprising:

- means for estimating noise;
- means for estimating speech together with some but not all of the noise;
- means for using the estimates to generate a noise reducing filter having a gain coefficient to control the gain of the signal containing noise to suppress the noise,

wherein the apparatus is configured to make a first estimation of the gain coefficient adaptively and to use the first estimation produce a noise estimation which is then used to produce a second estimation of the gain coefficient, wherein no use is made of a voice activity detector to detect non-speech periods.